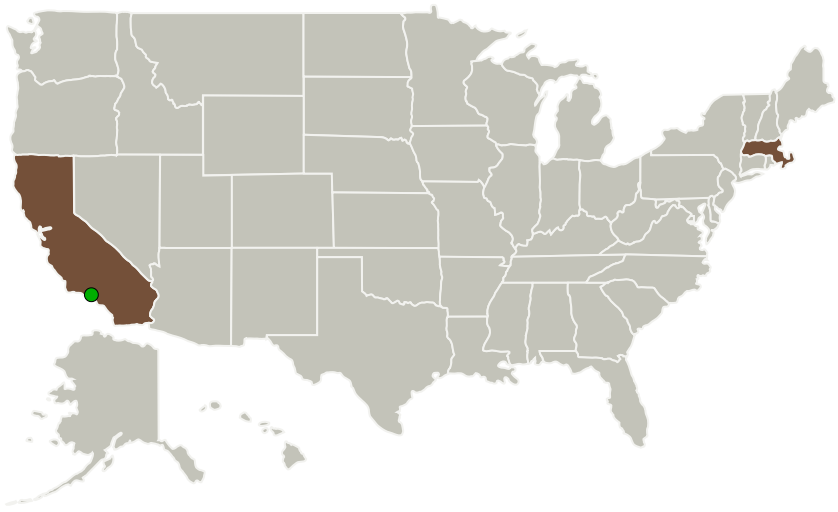
High-Efficiency, High-Power Ka-Band Elliptic-Beam Traveling-Wave-Tube Amplifier for Long-Range Space RF Telecommunications, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Space telecommunications require amplifiers that are efficient, high-power, wideband, small, lightweight, and highly reliable. Currently, helix traveling wave tube amplifiers (TWTA) are the technology of choice. Conventional helix TWTAs employ circular electron beams. Recently, lightweight circular-beam helix TWTAs have been demonstrated with power output in the range of several hundred watts and overall efficiency in the range of 40 to 60 percent. Despite these advances, there is substantial value in further improvement across all of these areas. Beam Power Technology (BPT) proposes a novel elliptic-beam TWTA which is highly efficient (75%) and has 500 W of CW power, reduced weight, lower voltage and an expected 15+ year lifetime. The average power operation is at a back-off of -6 dB from saturation. The linearity is -35 dBc. The Phase I objective is to determine the feasibility of an elliptic-beam helix TWTA which substantially exceeds the performance levels of conventional helix devices. In Phase II, BPT will complete the engineering design and experimental demonstration of a prototype targeting eventual deployment into satellite applications.

Primary U.S. Work Locations and Key Partners



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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Beam Power Technology, Inc.	Lead Organization	Industry	Sudbury, Massachusetts
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138273)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Beam Power Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

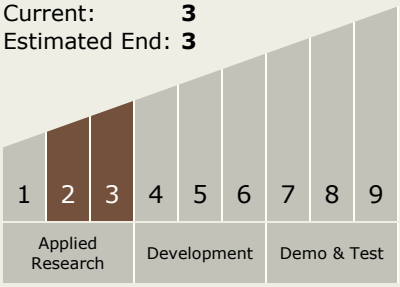
Carlos Torrez

Principal Investigator:

Jing Zhou

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.2 Radio Frequency
    - TX05.2.2 Power-Efficiency

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System